Speed & Velocity

DSHS Physical Science

Scalar or Vector Quantity?

Scalar Quantity	Speed	
Vector Quantity	Velocity	

Speed:

The rate at which an object covers distance.

A fast-moving object has a high speed and covers a relatively large distance in a short amount of time.

A slow-moving object that has a low speed; it covers a relatively small amount of distance in the same amount of time or longer amount of time.

An object with no movement at all has a zero speed.

Average speed versus Instantaneous speed

- **Average Speed** - the average of all instantaneous speeds; found simply by a distance/time ratio.
- **Instantaneous Speed** - the speed at any given instant in time.

The average speed formula:

$$\text{Average Speed} = \frac{\text{Distance Traveled}}{\text{Time of Travel}}$$

If we were looking for distance and given a speed and a time…. could we find it?

How about time, if given a speed and distance?

Solve:

1. A motorist travels 406 km during a 7.0 hr period. What was the average speed in km/hr ?

2. A bullet is shot from a rifle with a speed of 720 m/s. What time is required for the bullet to strike a target 3240 m away?

3. Light from the sun reaches the earth in 8.3 minutes. The speed of light is 3.0×10^8 m/s. In kilometers, how far is the earth from the sun?

Velocity:

The rate at which an object changes its position

Velocity at any instant is simply the speed value with a direction

Example of zero velocity...

Imagine a person moving rapidly - one step forward and one step back - always returning to the original starting position. While this might result in a frenzy of activity, it would result in a zero velocity.

Because the person always returns to the original position, the motion would never result in a change in position.

Average Velocity formula:

$$\text{Average Velocity} = \frac{\Delta \text{position}}{\text{time}} = \frac{\text{displacement}}{\text{time}}$$

If we were looking for displacement and given a velocity and a time…. could we find it?

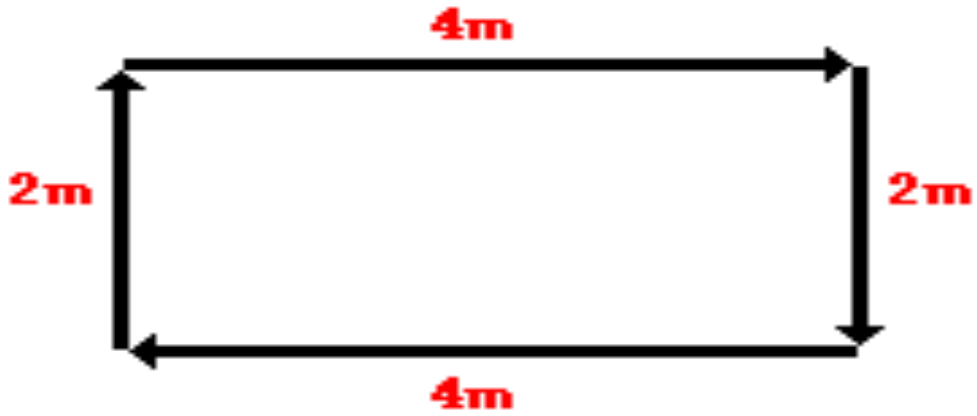
How about time, if given a velocity and displacement?

Solve:

1. Ann walked 1.5 miles south to her house in 0.5 hours. What is Ann's velocity.

2. Jeremie ran around the track at the YMCA for 2 hours. He started at the start line, and ended at the start line. When he was done he figured that he had traveled 20 kilometers. What was his velocity?

3. The car was moving for 3.7 hours and during that time moved 300 miles east and 220 miles south. What is the velocity?



The physics teacher walks 4 meters East, 2 meters South, 4 meters West, and finally 2 meters North. The entire motion lasted for 24 seconds.

Determine the average speed:

Determine the average velocity: